

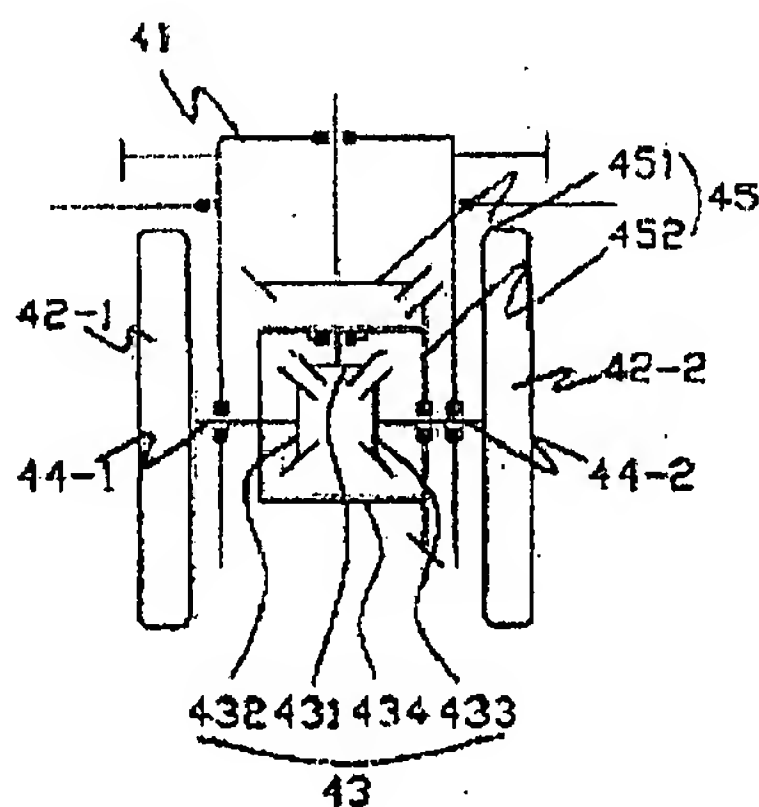
REMARKS

The Office Action dated November 26, 2008, has been received and carefully noted. The above amendments and the following remarks are being submitted as a full and complete response thereto.

Claims 1-9 are rejected. Claim 1 is amended, and Claim 7 is cancelled and incorporated into Claim 1. Thus, Claims 1-6, 8, and 9 are pending in this application. Support for the amendments may be found in the specification and claims as originally filed. Applicants submit that no new matter is added. Applicants respectfully request reconsideration and withdrawal of the rejections.

Rejection Under 35 U.S.C. §103

Claims 1-9 are rejected under 35 U.S.C. §103(a) as being unpatentable over Angeles (U.S. Patent No. 6,948,576 B2, hereinafter "Angeles") in view of Goldenberg et al. (U.S. Patent No. 6,113,343, hereinafter "Goldenberg"). Applicants respectfully traverse this rejection.



The present invention relates to a synchro-drive mobile robot base, in which a rotation of a turret, a driving of a mobile robot, and a determination of a direction of the movement of the mobile robot can be independently controlled by respective motors through mechanical coupling. That is, in the present invention, the actuating differential gear unit 43 is used in the wheel unit 40 so that, when the steering unit changes a direction of the movement of the wheel unit, two wheels 44-1 and 44-2 can be rotated in opposite directions.

For example, looking into the steering operation, for a counter-clockwise turn (rotational movement toward the left side at the picture), the wheel case 41 is turned left by the steering unit 10, and thus, the steering operation is started, and the input bevel gear 451 and output bevel gear 452 are rotated, in a state of being engaged with each other, as much as the wheel case 41 is turned.

At this time, the wheel 42-2, which is coupled to the rotating shaft 44-2, obtains an actuating force because of friction with the ground, and the rotating shaft 44-1 is finally rotated in the opposite direction to the rotating shaft 44-2 because the rotating force of the rotating shaft 44-2 is transmitted to the rotating shaft 44-1 while sequentially passing through the third gear 433, the first gear 431 and the second gear 432 of the actuating differential gear unit 43, and thus, the wheel 42-1 is rotated in the opposite direction to the wheel 42-2. At this time, the wheels 42-1, 42-2 are operated while maintaining the rotation center to the center thereof. That is, in the present invention, when turning left, the wheels 42-1, 42-2 are rotated in opposite directions as much as the wheel case 41 is rotated, so that the wheel case 41 is entirely turned left without the phenomenon of the wheel's slipping.

Moreover, in the present invention, even though the drive operation and the steering operation are simultaneously performed, since they maintain a decoupled state from each other, accelerating and decelerating operations, which correspond to the steering velocity, are performed to be identical with a state of stop at the two wheels.

As described above, in the present invention, the actuating differential gear unit 43 is applied to the wheel unit, so that the wheels are driven while maintaining the rotation center at the center of the wheels. Further, when the steering motor is operated, power is transmitted to the wheels 42-1, 42-2 so that the wheels can be rotated by a rolling operation, thereby preventing a drag phenomenon of both sides of the wheels (the phenomenon of the wheel slipping) during the steering operation.

In contrast to this, Angeles and Goldenberg do not disclose the actuating differential gear unit of the present invention as well as the present invention's constitution according to which a rotation of a turret, a driving of a mobile robot, and a determination of a direction of the movement of the mobile robot can be independently controlled by respective motors in such a way that two wheels are rotated in opposite directions when a direction of the movement of the wheels are changed by an actuating force of one steering motor.

In Angeles and Goldenberg, a direction of the wheel can be controlled by the control of a plurality of motors, but the constitution differs from that of the present invention in that two wheels can be rotated in opposite directions when steering by a driving force of the steering motor.

More specifically, there is no teaching or suggestion in either Angeles or Goldenberg of "a steering unit comprising a differential gear unit and transmitting an

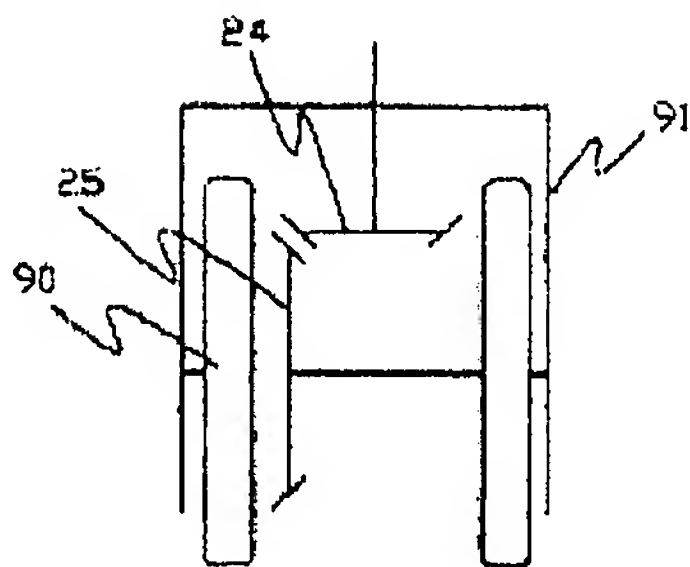
actuating force generated from the steering motor to a wheel case of a wheel unit" since there is no teaching or suggestion in either of a wheel case. Further, contrary to the position in the Office Action, neither reference teaches or suggests "the wheel unit comprises an actuating bevel gear coupled to the drive unit and supported by a bearing on a rotating wheel shaft having wheels on both ends thereof" or "both the actuating bevel gear and the actuating differential gear unit being provided in the wheel case," or the rotating wheel shaft passing through the wheel case," or "a steering gear of the steering unit being integrated with the wheel case," all as specifically claimed in Claim 1.

Consequently, it is strongly contended that clear differences exist between the present invention as claimed in Claims 1 – 6, 8 and 9 and the prior art relied upon. It is further contended that these differences are more than sufficient that the present invention as claimed would not have been rendered obvious to a person of ordinary skill in the art viewing those references. For at least the above reasons, Applicants respectfully request reconsideration and withdrawal of the rejection of Claims 1-9 under 35 U.S.C. §103(a) over Angeles in view of Goldenberg.

Double Patenting

Claims 1-9 are provisionally rejected on the ground of nonstatutory obviousness-type double patenting as being unpatentable over Claims 1 and 4 of U.S. Patent No. 7,328,759 B2 (hereinafter '759). This rejection is traversed since the proper standard for the rejection has not been given. The Office Action states that "...U.S. Patent No 7,328,759 B2 inherently claims..." and is using a direct recitation of Claims 1 and 4 of

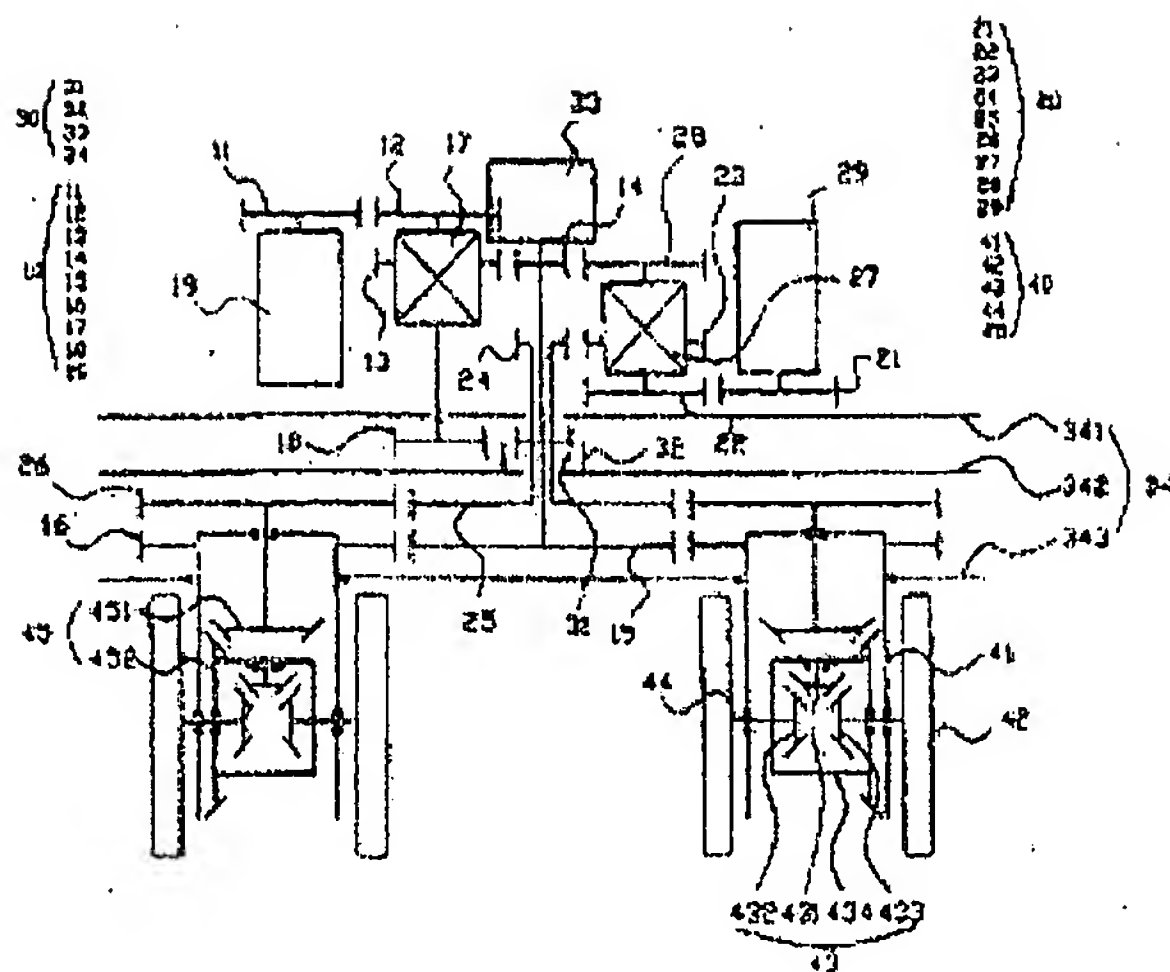
that patent without specifically applying the same to the claims of the present application.



In the invention disclosed in '759, as depicted in the figure, the power, which is transmitted to the wheel, is only formed at one wheel of the one side of the wheel unit, while another wheel of the opposite side maintains only a horizontal state and is of the free-wheel type.

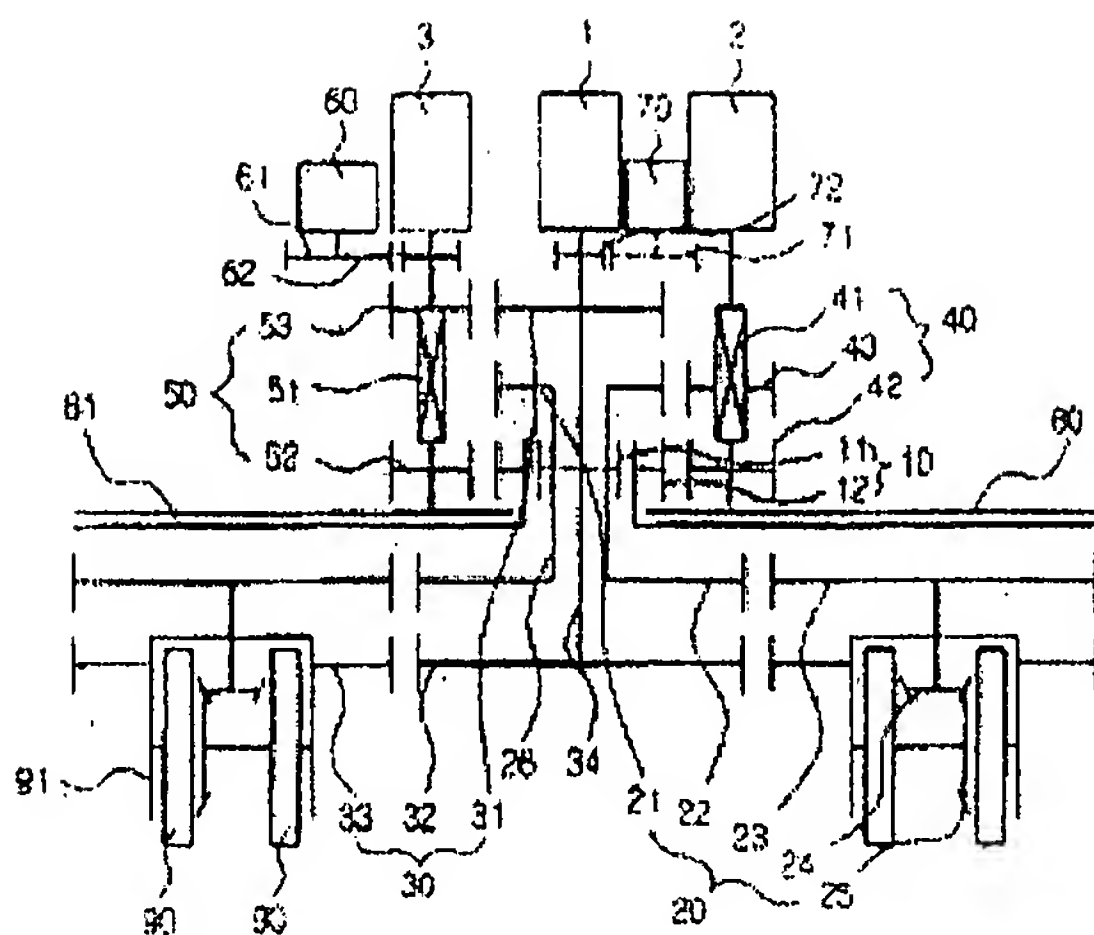
That is, in the invention disclosed in '759, the second bevel gear 25 is coupled by the first bevel gear 24, so that one wheel located on one side is only rotated, and another wheel located in the opposite side has a function to maintain a horizontal state and is of the free-wheel type. Like this, the wheels of '759 are problematic in that the robot's driving function may be lost because the robot's driving becomes impossible in the case where the body of the robot is maintained by the wheel of a free-wheel.

To solve this problem, power must be transmitted to all wheels in contact with the ground. In the case where two wheels are connected to the same actuating shaft, a drag phenomenon of both sides of a wheel roll is caused during a steering operation. The conventional arts solve this problem in separate ways.



In contrast therewith, in the present invention, the actuating differential gear unit is installed in the wheel unit, and thus, two wheels located in one wheel unit are driven in opposite directions during a steering operation, and therefore, can be operated while maintaining the rotation center at the center of the two wheels. Further, when the steering motor is operated, power is transmitted to the wheels so that the wheels can be rotated by a rolling operation, thereby preventing a drag phenomenon of both sides of the wheels during the steering operation.

The difference in such a constitution is intended to solve the problems of conventional arts, and the invention could not easily be embodied therefrom. Furthermore, the invention of '759 is different from the present invention with respect to a structure of the motor located on the upper part of the turret.



Namely, as shown in the above picture, in the invention disclosed in '759, a combination structure of the steering motor 3 and the second differential gear unit 50, and a combination structure of the drive motor 2 and the first differential gear unit 40 are of a series type.

In contrast, in the present invention, a combination structure of the steering motor 19 and the first differential gear unit 17, and a combination structure of the drive motor 29 and the second differential gear unit 27 are of a parallel type. The change in the structure is intended to reduce the height from the ground to the upper part when a product is really manufactured. As a result of this, the structure functions to reduce the size of a product.

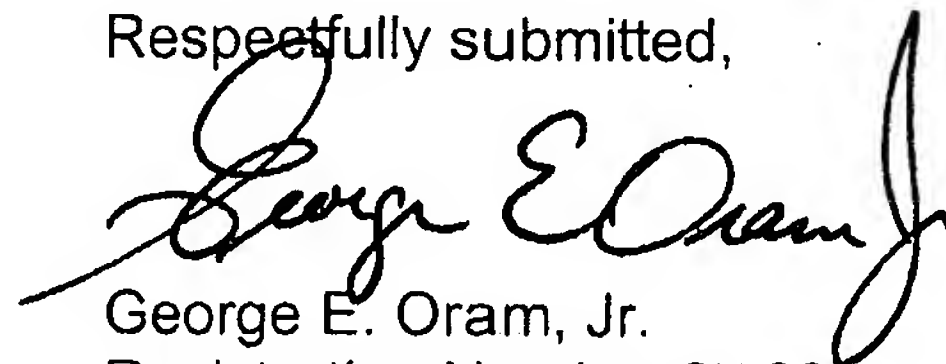
Accordingly, the present invention differs from the invention of '759 with respect to the technical constitution thereof. Consequently, it is strongly contended that clear differences exist between the present invention as claimed in Claims 1 – 6, 8 and 9 and the Claims 1 and 4 of '759. It is further contended that these differences are more than sufficient that the present invention as claimed would not have been rendered obvious to a person of ordinary skill in the art considering those claims.

Conclusion

Applicants respectfully submit that this application is in condition for allowance and such action is earnestly solicited. If the Examiner believes that anything further is desirable in order to place this application in even better condition for allowance, the Examiner is invited to contact Applicants' undersigned representative at the telephone number listed below to schedule a personal or telephone interview to discuss any remaining issues.

In the event that this paper is not being timely filed, the Applicants respectfully petition for an appropriate extension of time. Any fees for such an extension, together with any additional fees that may be due with respect to this paper, may be charged to Counsel's Deposit Account Number 01-2300, referencing Docket Number 101190-00051.

Respectfully submitted,



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